

IN THE CLAIMS:

1. (Currently Amended) A nonreciprocal optical element comprising:

circulator means for routing a first signal from a first port to a second port and a second signal from the second port to a third port, a third signal from the third port to a fourth port and a fourth signal from the fourth port to the first port;

first reflective means for reflecting a signal output by the second port back into the second port; and

second reflective means for reflecting a signal output by the fourth port back into the fourth port;

first control means for adjusting the phase of the signal output from the second port by adjusting the position of the first reflective means relative to the second port; and

second control means, independent of said first control means for adjusting the phase of the signal output from the fourth port by adjusting the position of the second reflective means relative to the fourth port.

2. (Original) The invention of Claim 1 wherein the circulator means includes a circulator.

3. (Original) The invention of Claim 1 wherein the reflective means is mirrors.

4. (Original) The invention of Claim 1 further including a first polarization rotation element between the second port and the first reflective means.

5. (Original) The invention of Claim 4 further including a second polarization rotation element between the fourth port and the second reflective means.

6. (Original) The invention of Claim 5 wherein the polarization rotation elements are quarter-wave plates.

7. (Original) The invention of Claim 1 further including first means for adjusting transmittance of the signal output by the second port disposed between the second port and the first reflective means.

8. (Original) The invention of Claim 7 further including second means for adjusting transmittance of the signal output by the fourth port disposed between the fourth port and the second reflective means.

9. (Original) The invention of Claim 8 wherein the means for adjusting transmittance is filters.

Claims 10 - 13 (Canceled)

14. (Original) The invention of Claim 1 further including means for effecting spectral control of the signal output from the second port.

15. (Original) The invention of Claim 14 wherein the means for effecting spectral control is a spectral filter.

16. (Original) The invention of Claim 15 wherein the spectral filter includes a Bragg grating.

17. (Original) The invention of Claim 15 wherein the spectral filter includes an interference filter.

18. (Original) The invention of Claim 1 further including means for effecting spectral control of the signal output from the fourth port.

19. (Original) The invention of Claim 18 wherein the means for effecting spectral control is a spectral filter.

20. (Original) The invention of Claim 19 wherein the spectral filter includes a Bragg grating.

21. (Original) The invention of Claim 19 wherein the spectral filter includes an interference filter.

22. (Currently Amended) A nonreciprocal optical element comprising:

a circulator having first, second, third and fourth ports, the first port being a first input/output port of the nonreciprocal optical element and the third port being a second input/output port of the nonreciprocal optical element;

a first mirror disposed to reflect a signal output by the second port back into the second port; and

a second mirror disposed to reflect a signal output by the fourth port back into the fourth port;

means for adjusting the phase of the signal output from the second port by adjusting the position of said first mirror relative to said second port; and

means for adjusting the phase of the signal output from the fourth port by adjusting the position of said second mirror relative to said fourth port.

23. (Original) The invention of Claim 22 further including a first polarization rotation element between the second port and the first mirror.

24. (Original) The invention of Claim 23 further including a second polarization rotation element between the fourth port and the second mirror.

25. (Original) The invention of Claim 24 wherein the polarization rotation elements are quarter-wave plates.

26. (Original) The invention of Claim 22 further including first means for adjusting transmittance of the signal output by the second port disposed between the second port and the first mirror.

27. (Original) The invention of Claim 26 further including second means for adjusting transmittance of the signal output by the fourth port disposed between the fourth port and the second mirror.

28. (Original) The invention of Claim 27 wherein the means for adjusting transmittance is filters.

Claims 29 - 30 (Canceled)

31. (Original) The invention of Claim 22 further including means for effecting spectral control of the signal output from the second port.

32. (Original) The invention of Claim 31 wherein the means for effecting spectral control is a spectral filter.

33. (Original) The invention of Claim 32 wherein the spectral filter includes a Bragg grating.

34. (Original) The invention of Claim 32 wherein the spectral filter includes an interference filter.

35. (Original) The invention of Claim 22 further including means for effecting spectral control of the signal output from the fourth port.

36. (Original) The invention of Claim 35 wherein the means for effecting spectral control is a spectral filter.

37. (Original) The invention of Claim 36 wherein the spectral filter includes a Bragg grating.

38. (Original) The invention of Claim 36 wherein the spectral filter includes an interference filter.

39. (Currenty Amended) A method for transmitting first and second signals in opposite directions through a device and effecting independent control thereof including the steps of:

routing a first signal from a first port to a second port and a second signal from the second port to a third port, a third signal from the third port to a fourth port and a fourth signal from the fourth port to the first port;

reflecting a signal output by the second port back into the second port; ~~and~~

reflecting a signal output by the fourth port back into the fourth port;

adjusting the phase of the signal output from the second port by translating a reflective element relative thereto; and

adjusting the phase of the signal output from the fourth port by translating a reflective element relative thereto.

40. (New) The invention of Claim 1 wherein said control means includes means for controlling said signal output by said second port or said fourth port in real time.

41. (New) The invention of Claim 22 wherein said control means includes means for controlling said signal output by said second port or said fourth port in real time.

42. (New) The invention of Claim 39 further including the step of controlling said signal output by said second port or said fourth port in real time.

43. (New) A nonreciprocal optical element comprising:

circulator means for routing a first signal from a first port to a second port and a second signal from the second port to a third port, a third signal from the third port to a fourth port and a fourth signal from the fourth port to the first port;

first reflective means for reflecting a signal output by the second port back into the second port;

second reflective means for reflecting a signal output by the fourth port back into the fourth port;

a first polarization rotation element between the second port and the first reflective means; and

a second polarization rotation element between the fourth port and the second reflective means.

44. (New) A nonreciprocal optical element comprising:

a circulator having first, second, third and fourth ports, the first port being a first input/output port of the nonreciprocal optical element and the third port being a second input/output port of the nonreciprocal optical element;

a first mirror disposed to reflect a signal output by the second port back into the second port;

a second mirror disposed to reflect a signal output by the fourth port back into the fourth port;

a first polarization rotation element between the second port and the first mirror; and

a second polarization rotation element between the fourth port and the second mirror.

45. (New) A nonreciprocal optical element comprising:

circulator means for routing a first signal from a first port to a second port and a second signal from the second port to a third port, a third signal from the third port to a fourth port and a fourth signal from the fourth port to the first port;

first reflective means for reflecting a signal output by the second port back into the second port;

second reflective means for reflecting a signal output by the fourth port back into the fourth port; and

means for effecting independent control of said signals output by said second port and said fourth port in real time.